

REMARKS/ARGUMENTS

Claims 8-13 are pending in this application. By this Amendment, Applicant AMENDS claim 8 and CANCELS claims 14-18.

Claims 8-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Umemoto et al. (JP 2003-319643) in view of Redl et al. (JP 2000-299978). Claims 11-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Umemoto et al. in view of Redl et al., and further in view of Official Notice. Claims 14-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Umemoto et al. in view of Official Notice.

Applicant respectfully traverses the rejections of claims 8-10.

Claim 8 has been amended to recite:

A DC/DC converter for, through the opening and closing of a switching element, supplying power from an input power supply, via a coil, to an output terminal connected to a load, and adjusting a voltage of the output terminal, the DC/DC converter comprising:

a coil current detection element interposed between the coil and the output terminal, and arranged to generate, in a terminal connected to the coil and a terminal connected to the output terminal, a detection voltage in response to a coil current;

a smoothing capacitor connected to the load side of the coil current detection element to smooth the voltage of the output terminal;

a reference current value control circuit arranged to detect the voltage of the coil side of the coil current detection element and to control a reference current value of a current flowing in the coil; and

a feedback circuit having an offset voltage generator arranged to generate an offset voltage that corresponds to the reference current value in response to an output voltage of the reference current value control circuit, and arranged to close the switching element in synchronization with a reference clock signal of a clock signal generator, and open the switching element in response to comparing the detection voltage with the offset voltage when the current flowing in the coil exceeds the reference current value. (emphasis added)

With the unique combination and arrangement of features recited in Applicant's claim 8, including the features of "a coil current detection element interposed between the coil and the output terminal, and arranged to generate, in a terminal connected to the coil and a terminal connected to the output terminal, a detection voltage in response to a coil current"

and “a feedback circuit having an offset voltage generator arranged to generate an offset voltage that corresponds to the reference current value in response to an output voltage of the reference current value control circuit, and arranged to close the switching element in synchronization with a reference clock signal of a clock signal generator, and open the switching element in response to comparing the detection voltage with the offset voltage when the current flowing in the coil exceeds the reference current value,” Applicant has been able to provide a DC/DC converter that does not deteriorate a transient response upon load changes and that suppresses the occurrence of oscillation phenomena, even when using a smoothing capacitor having both a small ESR value and a small capacitance (see, for example, paragraph [0012] of Applicant’s specification).

The Examiner alleged that the combination of Umemoto et al. and Redl et al. teaches each and every one of the features recited in Applicant’s claim 8. More specifically, the Examiner alleged that Umemoto et al. teaches “a coil current detection element being a coil current detection resistor (15) interposed between the coil and the output terminal [and] ... a feedback circuit (CP1 , CP2, FF, 18),” and that Redl et al. teaches that “a reference current value control circuit (26) is arranged to detect the voltage of the coil side of the coil current detection element (Rs) and to control a reference current value of a current flowing in the coil (L).” Thus, the Examiner concluded that “[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the reference current value control circuit arranged to detect the voltage of the coil side of the coil current detection element and to control a reference current value of a current flowing in the coil as shown in [Redl et al.] into the DC/DC converter of [Umemoto et al.] for the purpose of enhancing the power efficiency of the circuit via a better performance in controlling opening and closing the switching element.”

Applicant has amended claim 8 to recite the features of “a coil current detection element interposed between the coil and the output terminal, and arranged to generate, in a terminal connected to the coil and a terminal connected to the output terminal, a detection voltage in response to a coil current” and “a feedback circuit having an offset voltage generator arranged to generate an offset voltage that corresponds to the reference current value in

response to an output voltage of the reference current value control circuit, and arranged to close the switching element in synchronization with a reference clock signal of a clock signal generator, and open the switching element in response to comparing the detection voltage with the offset voltage when the current flowing in the coil exceeds the reference current value.” Support for these features is found, for example, in paragraphs [0033] and [0034] of Applicant’s specification and Fig. 1 of Applicant’s drawings.

Umemoto et al. teaches a switching power supply device as shown in Fig. 1 of Umemoto et al. This switching power supply device includes a resistance 15 that is arranged to output a detection voltage V_{rd} in response to a detection of a current I_o . The switching power supply also includes a flip-flop FF and a delay circuit 18 that are arranged to provide a command signal to a driver 13. However, as is admitted by the Examiner, Umemoto et al. fails to teach or suggest “a reference current value control circuit arranged to detect the voltage of the coil side of the coil current detection element and to control a reference current value of a current flowing in the coil” as is recited in Applicant’s claim 8.

Redl et al., which the Examiner relied upon for a teaching of a coil current detection element, merely teaches that an error signal generation circuit 26 is connected to a resistance R_s and an inductor L , as shown in Fig. 1 of Redl et al. The error signal generating circuit 26 is thus arranged to provide a regulating function as discussed in paragraph [0008] of Redl et al. However, nowhere in Redl et al. is there a teaching or suggestion of “an offset voltage generator arranged to generate an offset voltage” such as is recited in Applicant’s claim 8.

Thus, the combination of Umemoto et al. and Redl et al. clearly fails to teach or suggest the features of “a coil current detection element interposed between the coil and the output terminal, and arranged to generate, in a terminal connected to the coil and a terminal connected to the output terminal, a detection voltage in response to a coil current” and “a feedback circuit having an offset voltage generator arranged to generate an offset voltage that corresponds to the reference current value in response to an output voltage of the reference current value control circuit, and arranged to close the switching element in synchronization with a reference clock signal of a clock signal generator, and open the switching element in

Application No. 10/595,785
May 4, 2009
Reply to the Office Action dated February 5, 2009
Page 7 of 7

response to comparing the detection voltage with the offset voltage when the current flowing in the coil exceeds the reference current value” as recited in Applicant’s claim 8.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Umemoto et al. and Redl et al.

In view of the foregoing amendments and remarks, Applicant respectfully submits that claim 8 is allowable. Claims 9-13 depend upon claim 8, and are therefore allowable for at least the reasons that claim 8 is allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Dated: May 4, 2009

KEATING & BENNETT, LLP

1800 Alexander Bell Drive, Suite 200
Reston, VA 20191
Telephone: (571) 313-7440
Facsimile: (571) 313-7421

/Joseph R. Keating #37,368/
Attorneys for Applicant

Joseph R. Keating
Registration No. 37,368